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ABSTRACT

One of a series of curriculum guides prepared for the building occupations cluster of the construction/fabrication occupational group, this guide identifies the essentials of the plumbing and pipefitting trade as recommended by the successful plumber/pipefitter. An instructional program based upon the implementation of the guide is expected to prepare a student to adequately perform entry level tasks required of a plumber/pipefitter or to enter a post-secondary technical or apprenticeship program in plumbing and pipefitting where additional depth can be realized. Trade tasks or information are listed in chart form under the headings of safety; blueprint reading and planning; labor and material estimating; tools and equipment; selection and use of materials and supplies; layout, fabrication, assembly, installation, maintenance, and repair; and general competencies. Space is provided on the charts to record for each item the date completed, teaching methods used, and teaching materials used. Also included are a list of teacher responsibilities, guidance information and sources of occupational information, recommended tests and references, and a chart depicting the total construction/fabrication occupational curriculum. A typical application form for employment and a sample trade and industrial education injury report are appended. (HD)

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TRADE ANL INDUSTRIAL EDUCATION

TRADE PREPARATORY TRAINING GUIDE

PLUMBING AND PIPEFITTING

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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TABLE OF CONTENTS

Board Members 2

Definitions Used In This Guide 3

Occupational Analysis Chart 4

Introduction 5-6

Use Of This Guide 7

Teacher Responsibilities* 8-9

Plumbers and Pipefitters 10-22

Appendix A 23

Application For Employment 24

Appendix B 25

Recommended Texts And References 26

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DEFINITIONS USED IN THIS GUIDE

Major Occupational Group

A grouping of similar and related occupational area clusters. These groups include occupations that have been determined to be the most relevant and pertinent for inclusion in vocational education in Nebraska.

Occupational Area Clusters

These clusters are distinguishable in terms of similar work performed, materials used, products produced, and/or services rendered. They include a wide variety of common occupational skills and knowledge.

Occupation

The career or employment engaged in by an individual for remuneration. This activity includes technical competencies and related technical information often referred to as one's vocation.

Technical Competency

The specific tasks required for a vocational trade and industrial graduate to perform successfully at the entry level in an occupational area. These technical competencies apply to the psychomotor domain and include elements which emphasize motor skills such as: operate a machine; measure; etc.

Related Technical Information

The information the entry level worker must know in order to make appropriate trade decisions which will allow him to adequately perform the tasks or technical competencies of his occupation. This information applies to the cognitive domain and includes elements which are intellectual outcomes such as: knowledge and understanding.

Related General Information

Information which is desirable and good for the tradesman to know but which is not necessary to do his work properly; information that is nice to know, such as the history and development of his trade.

Related Guidance Information

Information that helps the student choose, prepare for, secure, hold, and make progress in an occupation.

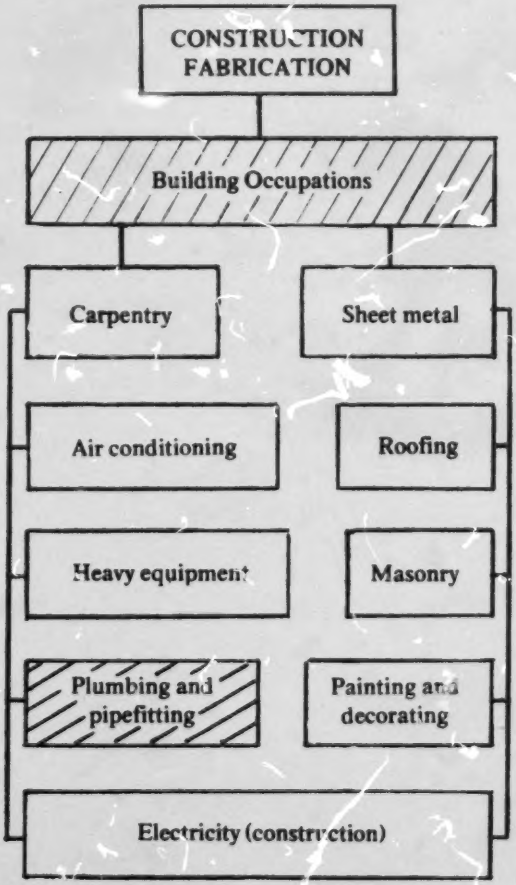
Entry Level

The technical competencies and related technical information deemed necessary by industry for obtaining and holding a job in a specific occupational area. This level of employment includes the technical competencies and related technical information that will be utilized by the employee within the first year of employment.

Occupational A nalysis Chart

The following chart shows Plumbing and Pipefitting as it relates to other occupations within the Building Occupations cluster. Building Occupations is one of two clusters which is a part of the major occupational group entitled Construction/Fabrication. This guide is concerned with Plumbing and Pipefitting only. Other guides have been prepared for each of the occupations found in this chart and are available through the Nebraska State Department of Education.

OCCUPATIONAL ANALYSIS CHART
[PROJECT MODEL]



INTRODUCTION

This curriculum guide has been prepared with the help of competent craftsmen in the building trades. The funds that made this guide a reality were provided through a federal research grant in cooperation with the Nebraska State Board for Vocational Education and sponsored by the Nebraska Research Coordinating Unit.

Curriculum guides have been prepared for several trade and industrial occupational clusters from which high school teachers can develop appropriate occupational related experiences for their students. The major occupational groups, occupational area clusters, and occupations are shown in graphic form on pages of this guide.

Selection of trades within four major occupational groups have been made based on a three year survey by the Nebraska Research Coordinating Unit on needs of Nebraska business and industry. This study has identified the occupations with the greatest need for employees. A related set of curriculum guides have been prepared for these occupations.

Guidance Information

The U.S. Department of Labor has developed an extremely helpful book entitled, "Occupational Outlook Handbook." This annual publication provides a very complete description of the activities of the persons employed in the occupations represented in the Nebraska trade and industrial curriculum guides. Information concerning current and future opportunities is a major portion of this publication. Inexpensive reprints in booklet form that describe individual occupations are available through the Department of Labor. These booklets should be used by trade and industrial teachers and school guidance counselors for the most up-to-date guidance information about a particular occupation.

A listing of these reprints from the "Occupational Outlook Handbook," the order number, and price per copy is listed below for those occupations in the occupational area cluster of "Building Occupations."

Number	Title	Price
1650-69	Bricklayers, Stonemasons, Marble Setters, Tile Setters, Terrazzo Workers	.20
1650-70	Carpenters, Painters and Paperhangers, Glaziers	.20
1650-71	Cement Masons, Lathers, Plasterers	.20
1650-72	Construction Laborers and Hod Carriers	.15
1650-73	Electricians (Construction)	.15
1650-75	Floor Covering Installers	.15
1650-77	Plumbers and Pipefitters	.15

1650-78 Roofers, Sheet-Metal Workers 15
1650-80 Air-Conditioning, Refrigeration, and Heating Mechanics 10

The Plumbing and Pipefitting Guide

This guide uses the title Plumbing and Pipefitting as the most logical descriptive term for identifying a particular related group of workers. Identification of specific job titles within this group should be determined by referring to the "Dictionary of Occupational Titles." The USOE classification system for coding instructional programs has assigned 17.1007 to the instructional program, Plumbing and Pipefitting.

The information within this guide identifies the essentials of the plumbing and pipefitting trade as recommended by the successful plumber/pipefitter. An instructional program based upon the implementation of this guide will prepare a student to adequately perform entry level tasks required of a plumber/pipefitter or to enter a post-secondary technical or apprenticeship program in plumbing and pipefitting where additional depth can be realized.

The tasks and/or competencies identified within these covers are those agreed upon by a jury of reputable Nebraska plumbers and pipefitters. A separate group of persons directly employed within this trade in Nebraska have further verified these tasks and/or competencies. Jury members, tradesmen, and educators who contributed toward the development of content for this guide are listed in the front.

Course offerings in trade and industrial education in Nebraska are to be organized within two period blocks of time each day, five days a week. Time is to be set aside for classroom instruction directly related to manipulative laboratory instruction. The remainder of the student's school day is to be utilized for general education subjects.

USE OF THIS GUIDE

The use of curriculum guides for trade and industrial education in Nebraska secondary schools may vary greatly, depending upon the depth and breadth of each school district's vocational program. Large school districts, for example, may utilize one particular curriculum guide to develop a course in a trade area such as plumbing and pipefitting. A small school district may, on the other hand, incorporate several curriculum guides to develop a course in the building trades occupational cluster.

The manipulative content identified in this guide is deemed necessary for inclusion in a course that is designed to prepare entry level plumbers and pipefitters. While not all secondary school facilities in Nebraska are equipped to expose students to all of this content through hands-on experience, it is assumed that this content will, through some media, become related technical information. This will insure inclusion of all content and provide at least discussion level understanding.

This guide is written with the assumption and expectation that the related technical information necessary to perform technical competencies will be an integral part of instruction. Thus, occupational decisions that must be made by an entry level worker will be developed along with each related manipulative activity.

The plumbing and pipefitting instructor who uses this guide is responsible for including the identified related technical information as well as the identified manipulative tasks. He is also responsible for the identification of competencies pertaining to general and guidance information, even though this information is not specifically identified for him.

Definitions for various terms used in this guide are presented in the front.

TEACHER RESPONSIBILITIES*

1. Use the American Vocational Association National Safety Council's "National Standards School Shop Safety Inspection Check List" for shop safety inspections. (Available from American Vocational Association, 1510 "H" Street, N.W., Washington, D.C. 20005)
2. Use safety check list to assure safe factors exist.
3. Require students to report ALL accidents to instructor.
4. Keep complete records of ALL accidents on file.
5. Report ALL accidents to the school administration.
6. Develop safety consciousness in the students through teacher example—always doing things in the safe way.
7. Give shop demonstrations stressing safe use of machines.
8. Give shop demonstrations stressing safe use of hand tools.
9. Provide instruction on what to do in case of an accident.
10. Develop information sheets dealing with the safe use of specific machines.
11. Give demonstrations on the proper use and care of personal protective devices.
12. Develop information sheets dealing with the general safety rules for the trade.
13. Enclose all gears, moving belts, and other power transmission devices with permanent guards.
14. Prohibit students from operating machines when instructor is not present.
15. Prohibit the removal of guards and safety devices, even for a brief period, without the approval of the instructor.
16. Prohibit more than one operator from using a machine at one time.
17. Determine personal liability factors and liability coverage afforded through your school.
18. Provide for the bulk storage of flammable materials.
19. Mark the location of fire-fighting equipment
20. Post instructions and inform students of building evacuation procedures.
21. Require the wearing of appropriate eye protection as specified by the State of Nebraska eye safety regulations.
22. Keep tools sharp, clean and in good working condition.

*These responsibilities are necessary for inclusion in all trade and industry programs in the State of Nebraska.

23. All shop personnel should be thoroughly familiar with the location of fire extinguishers and the type fire for which each extinguisher is designed.

10

PLUMBING AND PIPEFITTING CONTENT
[Identified Trade Tasks or Information]

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
SAFETY			
Know and abide by Federal Safety Regulations.			
Exercise care in handling or using machines.			
Exercise care in handling or using tools.			
Report unsafe conditions to immediate supervisor.			
Exercise care in using and storing inflammables and combustibles.			
Correct unsafe conditions of tools and machines.			
Provide adequate ventilation when using solvents and gases.			
Correct unsafe conditions of ladders and scaffolding.			

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
Recognize safe areas of job or construction site—avoid unsafe areas.			
Exercise care in all operations about job or construction site.			
G			
BLUEPRINT READING AND PLANNING			
Read, understand, and interpret blueprints (building plans).			
Interpret blueprint symbols.			
Use an engineer and architect's scale.			
LABOR AND MATERIAL ESTIMATING			
Estimate total cost of job.			
Estimate labor needed for total job.			

Estimate materials and supplies needed for total job.

Plan sequence of installation to avoid obstructions and activities of other construction workers.

TOOLS AND EQUIPMENT

Use and maintain the following tools and equipment:

13

water pressure gages

cutting torch

oxyacetylene welder

channel lock pliers

air pressure gages

steel ruler

spirit level

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
plumb bob			
hand saw			
power hand saw			
power drill motor			
pipe cutter			
pipe-threading machine			
pipe cutting machine			
brace and bit			
pipe vise			
machinist vise			
blow torch			
claw hammers			
sledge hammer			

chain hoist

ball peen hammer

hand bending block

flaring tool

screw drivers

cold chisels

shovel

tile shovel

transit

tubing cutter

pipe wrench

adjustable open end wrench

gas melting pot

pipe reamer

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
SELECTION AND USE OF MATERIALS AND SUPPLIES			
Select proper types of mounts, clamps, brackets, and hangers.			
Determine strength of ropes, chains, and slings.			
Select appropriate fasteners (screws, rivets, nails, etc.)			
Select proper materials and fittings according to local building code.			
Determine type of fastener and method for fastening components and fixtures.			
Aid customer in selection of plumbing fixtures and accessories.			
LAYOUT, FABRICATION, ASSEMBLY, INSTALLATION, MAINTENANCE, AND REPAIR (Operations and/or jobs)			

Locate and mark position of pipe and connection and passage holes for pipes in walls and floors.

Cut openings in wall, ceilings, roofs, floors, etc.

Cut and thread pipe.

Establish grade of drains.

Install sump pump.

Connect house system to sewer or leaching field.

Layout, fabricate, assemble, install, and maintain equipment for steam systems.

Install and maintain meters.

Join piping by means of the following joints: threaded, calked wiped, soldered, brazed, cemented (plastic), and leaded.

Secure pipes to structures with clamps, brackets, and hangers.

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
Layout ditch work and set man holes.			
Install and repair water heaters.			
Install and repair commodes.			
Install and repair bathtubs.			
Install and repair sinks.			
Install fresh air inlets.			
Install and repair dish washers.			
Install and maintain refrigeration and air conditioning systems.			
Layout, fabricate, assemble, install, and maintain piping and piping systems.			
Layout, fabricate, assemble, install, and maintain plumbing fixtures.			
Install and maintain pumps.			

Layout, fabricate, assemble, install and maintain equipment for cooling systems.

Assemble and install valves, fittings, and pipes composed of metals such as iron, steel, brass, and lead.

Layout, fabricate, assemble, install, and maintain equipment for hot water systems.

Layout, fabricate, assemble, install, and maintain equipment for heating systems.

19

Install leaching field and septic tank.

Layout gas pipe line.

Layout, fabricate, assemble, install and maintain equipment for lubrication systems.

Bend tubing.

Bend pipe.

Assemble and install valves, fittings, and pipes composed of nonmetals, such as glass, vitrified clay and plastic.

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
Install drainage tile around footings.			
Install and maintain pneumatic and hydraulic controls and piping.			
Install and maintain compressors.			
Layout, fabricate, assemble, install and maintain equipment for industrial processing systems.			
Install faucets.			
Install floor and area drains.			
Install cleanouts.			
Repair and maintain plumbing by performing the following jobs or operations: replace washers in leaky faucets, repair burst pipes, open clogged drains, replace traps and drains.			
Install and repair water softeners.			
Install and repair garbage disposal units.			

Install and repair septic tanks and systems.

GENERAL COMPETENCIES

Test piping systems for leaks by increasing pressure in pipes and observing gages attached to pipes.

Test drainage systems.

Shore ditches.

Braze holding fixtures to structural members.

Weld holding fixtures to structural steel members.

Tie knots used in rigging.

Use arm and hand signals for directing heavy equipment.

Inspect worksites to determine presence of obstructions in running yard lines, etc.

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIALS USED
Inspect worksites to ascertain that holes will not cause structural weaknesses.			
Determine proper rigging of equipment.			

Appendix A

One of the primary objectives of trade and industrial education is the successful placement of students completing course work in a specific occupation. The following sample application form is included in this guide with the recommendation that the preparation of such forms become a necessary activity for students in all trade and industrial education courses.

APPLICATION FOR EMPLOYMENT

PERSONAL INFORMATION

DATE _____ SOCIAL SECURITY NUMBER _____

NAME _____ (LAST, FIRST, MIDDLE) — LAST

PRESENT ADDRESS _____ (STREET, CITY, STATE)

PERMANENT ADDRESS _____ (STREET, CITY, STATE)

PHONE NO. _____ OWN HOME ____ RENT ____ BOARD ____

DATE OF BIRTH _____ HEIGHT _____ WEIGHT _____ COLOR OF HAIR _____ COLOR OF EYES _____

MARRIED ____ SINGLE ____ WIDOWED ____ DIVORCED ____ SEPARATED ____

NUMBER OF CHILDREN _____ DEPENDENTS OTHER THAN WIFE OR CHILDREN _____ CITIZEN OF U. S. A. YES ○ NO ○ — FIRST

IF RELATED TO ANYONE IN OUR EMPLOY, STATE NAME AND DEPARTMENT _____ REFERRED BY _____

EMPLOYMENT DESIRED — MIDDLE

POSITION _____ DATE YOU CAN START _____ SALARY DESIRED _____

ARE YOU EMPLOYED NOW? _____ IF SO MAY WE INQUIRE OF YOUR PRESENT EMPLOYER _____

EVER APPLIED TO THIS COMPANY BEFORE? _____ WHERE _____ WHEN _____

EDUCATION	NAME AND LOCATION OF SCHOOL	YEARS ATTENDED	DATE GRADUATED	SUBJECTS STUDIED
GRAMMAR SCHOOL				
HIGH SCHOOL				
COLLEGE				
TRADE, BUSINESS OR CORRESPONDENCE SCHOOL				

SUBJECTS OF SPECIAL STUDY OR RESEARCH WORK _____

WHAT FOREIGN LANGUAGES DO YOU SPEAK FLUENTLY? _____ READ _____ WRITE _____

U. S. MILITARY OR NAVAL SERVICE _____ RANK _____ PRESENT MEMBERSHIP IN NATIONAL GUARD OR RESERVES _____

CONTINUED ON OTHER SIDE

FORMER EMPLOYERS (LIST BELOW LAST FOUR (4) EMPLOYERS, STARTING WITH LAST ONE FIRST.)

DATE MONTH AND YEAR	NAME AND ADDRESS OF EMPLOYER	SALARY	POSITION	REASON FOR LEAVING
FROM				
TO				
FROM				
TO				
FROM				
TO				
FROM				
TO				

REFERENCES: GIVE BELOW THE NAMES OF THREE (3) PERSONS NOT RELATED TO YOU, WHOM YOU HAVE KNOWN AT LEAST ONE YEAR.

	NAME	ADDRESS	BUSINESS	YEARS ACQUAINTED
1				
2				
3				

PHYSICAL RECORD:

LIST ANY PHYSICAL DEFECTS

WERE YOU EVER INJURED? GIVE DETAILS

HAVE YOU ANY DEFECTS IN HEARING? IN VISION? IN SPEECH?

IN CASE OF EMERGENCY NOTIFY

NAME ADDRESS PHONE NO.

I AUTHORIZE INVESTIGATION OF ALL STATEMENTS CONTAINED IN THIS APPLICATION. I UNDERSTAND THAT MISREPRESENTATION OR OMISSION OF FACTS CALLED FOR IS CAUSE FOR DISMISSAL. FURTHER, I UNDERSTAND AND AGREE THAT MY EMPLOYMENT IS FOR NO DEFINITE PERIOD AND MAY, REGARDLESS OF THE DATE OF PAYMENT OF MY WAGES AND SALARY, BE TERMINATED AT ANY TIME WITHOUT ANY PREVIOUS NOTICE.

DATE SIGNATURE

DO NOT WRITE BELOW THIS LINE

INTERVIEWED BY DATE

REMARKS:

NEATNESS		CHARACTER	
PERSONALITY		ABILITY	

HIRED FOR DEPT. POSITION WILL REPORT SALARY WAGES

APPROVED: EMPLOYMENT MANAGER DEPT. HEAD GENERAL MANAGER

Appendix B

One of the most important parts of any trade and industrial education course is a safety program. The following form is recommended for use in courses of this type.

SAMPLE
TRADE AND INDUSTRIAL EDUCATION
INJURY REPORT* **

Student injured _____ Date _____

Shop in which accident occurred _____ Time _____

Instructor in charge _____

Nature of injury _____

_____

First aid administered _____

_____ By whom? _____

Cause of injury _____

_____

Could injury have been prevented? ____ How? _____

_____

Action taken or recommendations made to prevent recurrence _____

Remarks: _____

_____

_____

Signed _____
(Person making report)

Witnesses: _____

Names _____
and
Addresses _____

*Complete in Duplicate
**File one copy in office

RECOMMENDED TEXTS AND REFERENCES

Plumbers and Pipefitters

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——. *Vocational Instructional Materials for Trade and Industrial Occupations.* Washington, D.C.: U.S. Government Printing Office, Stock Number 1780-0842, 1971. (This book of curriculum materials lists innumerable sources of great value to the T & I teacher. These free or inexpensive materials have been printed by the U.S. Government Printing Office. Your copy of this catalog will cost $1.50 and is available from the following address:

Superintendent of Documents
U.S. Government Printing Office
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